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ABSTRACT

The distribution of funds for university administration and support for a hypothetical state university system using 11 state funding formulas is reviewed. Data for a hypothetical system of 11 institutions of varying size and student level mix were used. The distributions for university administration and support include library support, student services, general administration, and general expense. These were compared with a measure of scale, or workload. In aggregate the formulas appeared to respond to both economies of scale and diseconomies of complexity although significant variation in the treatment of these issues by individual formulas appeared to exist. (Author/SW)

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Formula Funding of University Administration and Support

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THE ASSOCIATION FOR INSTITUTIONAL RESEARCH

This paper was presented at the Twentieth Annual Forum of the Association for Institutional Research held at the Peachtree Plaza Hotel in Atlanta, Georgia, April 27 - May 1, 1980. This paper was reviewed by the AIR Forum Publications Committee and was judged to be of high quality and of interest to others concerned with the research of higher education. It has therefore been selected to be included in the ERIC Collection of Forum papers.

Mary Corcoran
University of Minnesota
(Editor, AIR Forum Publications)

It has become increasingly apparent that the financial difficulties which beset Higher Education in the 70's will probably continue, with some additions, in the 80's. (Glenny, 1976; Spence, 1978; Gross, 1979; Flaig, 1979). A by-product of this situation has been a movement to improve funding formulas and allocation procedures (Spence, 1978; Budgeting of Postsecondary Education in the Eighties, 1978; Gross, 1979). Examples are analyses directed towards the anticipation and avoidance of future problems (Boutwell, 1973; Spence, 1978; Budgeting of Postsecondary Education in the Eighties, 1978; Yeager and Linhart, 1978; Blau, 1979; Gross, 1979), the adjustment to immediate problems (A Composite Support Index..., 1976), and summaries and analyses of current formula budgeting and funding practices (Cope, 1968; Program Funding by Formula..., 1977; Spence, 1978; Linhart and Yeager, 1978). The purpose of this paper is to further that process by reviewing the distribution of resources for the area of university administration and support across a hypothetical state university system by a sample of current budget formulas.

A major area of consideration in this area revolves around the concept of economies of scale. This concept proposes that lower unit costs may occur at larger institutions through the establishment of many centralized administrative operations (Peterson, 1977). Various studies have demonstrated this phenomena in the expenditure patterns of institutions of higher education (Russell and Doi, 1955; Hawley, Boland, and Boland, 1965; Carnegie Commission, 1972; Jellema, 1973; Ven Horst and

Henkhaus 1973; California Coordinating Council for Higher Education, 1977). These studies have been less than conclusive, however, because the analyses were conducted on relatively homogenous groups of institutions or focused on differences among smaller institutions. For example, Hanley et. al. (1965) grouped together institutions with 350 or more faculty while Jellema, (1973) grouped all institutions with an enrollment larger than 4,000 students. Hanley et. al. (1965) did show that the ratio of full-time equivalent administrators to faculty increased as complexity (measured by the number of schools and colleges) increased, but this "complexity effect" did not entirely offset the trend toward a decreased ratio of administrators to faculty as the size of faculty increased. Similarly, Jellema (1973) showed that while the percent of expenditures for General Administration, Student Services, and General Expense tended to decrease as the enrollment approached 4,000, the percent of expenditures for the Library increased. More recent studies have indicated that complex organizations (Blau, 1974), including institutions of higher education (Broomall, Mahan, McLaughlin, and Patton, 1978; McLaughlin, Montgomery, Smith, Mahan, and Broomall, 1980), do not tend to exhibit economies of scale.

METHOD

Procedure

The distributions of resources by the formulas of 11 states were calculated using data from a hypothetical system of 11 institutions of varying size and student level mix. The formulas were obtained from two publications, "Program Funding by Formula

of the Unrestricted Current Fund Operations of Kentucky's Public Higher Education Institutions" (Revised, 1977)- and Linhart and Yeager (1978). The calculations contained all formulas that were available and presented in sufficient detail to run all relevant computations. Included were formulas from the following states:

Alabama	New Mexico
Arkansas	South Carolina
Florida	Tennessee
Georgia	Texas
Louisiana	Virginia
New Jersey	

The formula for New Jersey was included as a constant dollars/FTE-S rate per base factor unit formula. This represents a conservative estimate for the comprehensive institutions as additional funding is provided for Rutgers and NJIT (Kentucky Council on Public Higher Education, 1977). The distributions for the Virginia formula were estimated using salary averages for academic, non-academic and Library positions from the Florida State University 1977-78 Operating Budget, and positions generated by the Virginia formula.

The distributions for University Administration and Support include Library Support, Student Services, General Administration and General Expense (as defined by Kentucky Council on Public Higher Education, 1977). These were compared with a measure of scale, or workload. Because the particular workload parameter chosen for the comparison could have an impact on the results, the percentage distribution of the five most common workload

measures were averaged. Table 1 shows the distribution of I&R Base budget, Academic Positions, Student FTE, Student Credit Hours, and Student Headcount. The analysis consisted of calculating the difference between the mean percent of resources provided to each institution by the formulas and the mean of that institution's percent of the workload measures. The difference was calculated as a percentage adjustment of the workload measure. For example, if institution X averaged 5% of the workload measures and 6% of the formula distributions, the difference, 1%, was considered to be a 20% positive adjustment to the workload measure (1 ÷ 5 = 20). The adjustment for each institution was then compared to its general size and student level mix.

The analysis described above was then performed for University Administration (less Library Support), where this was broken out seperately in the formulas of the sample states.

The Formulas

Table 2 describes the formulas compared in the study. The classification of computational method was based on the work of Gross (1973) with two exceptions; "the rate per base factor unit" category was expanded to indicate the existence and type of differentiation in rate, where applicable, and an additional category, "need-deficit," was added to describe a component in formula 1. A need-deficit formula is defined here as one in which need is estimated based on a set of standards and compared to existing circumstances. The distribution of deficit between existing circumstances and the standard is then used to

distribute available resources. As shown on Table 2, the sample of formulas includes a diverse range of workload measures, computational methods, and number of formula components.

The Universities

Table 1 shows the workload measures associated with each university in the sample and Table 3 shows the distribution of student FTE by level. Institutional size varies from 2,509 to 20,003 FTE-S. Institutions B, C, E, I, J, and K provide examples of institutions of varied size with relatively large graduate programs while institutions A, D, F, and H provide examples of institutions of varied size with relatively small graduate programs. Institutions E, F, and H offer limited doctoral programs while I, J, and K are comprehensive universities.

RESULTS

Despite a wide range of workload measures, computational methods and number of formula components (Table 2), the distributions shown on Table 4 for formulas 4 through 11 appear to be very similar. Formulas 1 through 3 appear to differ from the rest due to economy of scale adjustments, with formula 1 being extremely different from the others. The highest percentages for the 5 smallest institutions and the lowest for the 3 largest institutions were all generated by formulas 1 through 3. It is also interesting to note that the greatest variation, as indicated by the standard deviation, appears to occur among formula percentages distributed to the 3 comprehensive institutions.

Table 5 compares the mean of the workload distributions, shown on table 1, to the mean of the university administration and support formula distributions, shown on Table 4. Differences between these distributions are assumed to represent the aggregate recognition of institutional complexity and scale economies by the sample formulas. Row III of Table 5 and Figure 1 express this difference as a percentage adjustment to the mean of the workload distributions. Comparing these to the percentage mix of student FTE by level shown on Table 3, some interesting patterns emerge. For example, institution A received a much smaller supplement beyond the workload measure than did institution B with a similar total enrollment but a higher percentage of enrollment at the graduate level. Similarily, institutions C and E received a supplement while institution D, of similar size but with a much smaller graduate program, did not. The same pattern continues among the larger institutions. Institution H, with relatively small graduate programs, showed the only strong scale related reduction. Institution J with a slightly smaller percent of student FTE at the Beginning and Advanced Graduate level than institutions I and K averaged slightly lower support relative to the workload measure. While supplements due to scale diseconomies do appear for the very smallest institutions and for smaller, complex institutions, reductions due to scale economies appear to be recognized only in the larger institutions with relatively small graduate and doctoral programs.

Table 6 displays the distributions for University Administration (less Library) for the 7 formulas in the sample in which needs in these areas are seperately estimated. These appear to display much less consistency than was noted above for the combined formulas, expecially for the 3 comprehensive institutions. Again, there appears to be a marked difference between formulas which recognize scale economies for comprehensive institutions, and those which do not. The mean distribution produced by the University Administration formulas shows aggregate tendencies similar to the mean of the University Administration and Support distributions although with a much stronger economy of scale adjustment.

The two most graduate intensive comprehensive institutions appear to have a scale related reduction although it remains small. The supplement for the smaller institutions appears to have grown considerabley, with institution D now showing an 8% supplement.

DISCUSSION

The results presented here should be viewed as tentative since all formulas currently in use have not been included, those used in the paper may have been recently revised in ways which would affect the results, and the formula computations have not been reviewed by the respective states. Also, a more comprehensive study should probably include expenditure or budgetary data to assess the possible impact of variations in the total level of support on the decisions embodied in the formulas of particular states.

The funding formulas in the sample appear, in aggregate, to recognize both economies of scale and diseconomies of complexity as indicated by the size and composition of the graduate program. When Library Support is included, scale related reductions for larger institutions tend to appear for those with relatively small graduate programs but not for comprehensive universities. Similarily, supplements for smaller institutions appear to be related to both size and complexity.

Hawley et. al. (1965) suggested that as size increased, economies of scale occured in the ratio of administrators to faculty but that this was somewhat offset when increases occurred in complexity. This pattern appears to be reflected in the distributions produced when Library Support is excluded. Jellema (1974), on the other hand showed that expenditures for Library Support increased for institutions with larger graduate and doctoral programs. Examination of current formulas for Library Support reveals that they are consistent with this finding. Combining the two trends, one would expect to find the tendencies shown in the distributions of combined formulas, with economy of scale reductions for large, simpler institutions but not for complex ones and with larger supplements for small, complex institutions than for small, simple ones.

It appears from this study that, in aggregate, formulas for University Administration and Support tend to react to variations in institutional size and complexity in a manner consistent to that suggested by theory and earlier expenditure analyses. The more recent findings by Blau (1974), Broomall et al. (1978) and

McLaughlin et al. (1980) do not yet appear to be incorporated into many of the formulas. As a result, the treatment of economies of scale appears to be the principal source of variation between current budget formulas for University Administration and Support.

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TABLE 1
Distribution of Workload Measures

		Institution									
		A	B	C	D	E	F	G	H	I	J
I.	I & R Base[1]	4753282	5434792	7340539	8186899	9739045	13654674	14917268	29746412	33823740	42135014
	Percent	2.21	2.53	3.41	3.80	4.52	6.34	6.93	13.35	15.70	19.56
II.	Academic Positions	139.98	159.23	216.78	241.10	285.74	393.29	437.50	845.37	989.59	1235.26
	Percent	2.23	2.53	3.45	3.84	4.55	6.35	6.96	13.45	15.75	19.65
III.	Student FTE	2509.54	2509.54	3524.97	4322.35	4401.31	6787.50	6958.90	13873.48	14826.48	20003.47
	Percent	2.52	2.52	3.53	4.33	4.41	6.81	6.98	13.91	14.87	20.06
IV.	Qtr. Credit Hrs.	146202	142197	203045	259161	253033	366446	404118	811584	848818	115842
	Percent	2.58	2.48	3.54	4.52	4.40	6.38	7.04	14.14	14.79	20.18
V.	Headcount	2925	3919	4706	5038	6704	9390	10487	19485	17978	22373
	Percent	2.30	3.08	3.70	3.96	5.27	7.38	8.24	15.31	14.12	17.58
	Mean	2.37	2.63	3.53	4.09	4.63	6.65	7.23	14.03	15.05	19.40

[1]Percent of all institutions in the sample

TABLE 2
Allocation Parameter and Formula Structure
of the Formulae for University Support of Selected State University Systems

		Formulas									
		1	2	3	4	5	6	7	8	9	10	11
I.	Workload Measure											
	Faculty FTE	X			X							
	Student Credit Hours		X	X			X					X
	Student FTE				X						X	
	Student Headcount	X		X			X					X
	Instruction & Project Research Base					X		X	X	X		X
	I & PR & General Support						X					
	Sponsored Research											X
II.	Computational Method											
	A. Rate per base factor unit										X	
	1. Flat Rate			X								X
	2. Size Differential	X	X		X		X					X
	3. Level Differential		X	X	X		X					
	B. Base factor position ratio with salary rates				X							
	C. Percentage of base factor			X		X	X	X	X	X		X
	D. Need-Deficit	X										
III.	Number of Formula Components	3	3	3	4	1	3	1	2	2	1	5

TABLE 3
Percentage Mix of Student FTE by Level

	Institution									
	A	B	C	D	E	F	G	H	I	J	K
Student Level											
Lower Level	46.12	- 0 -	- 0 -	46.12	- 0 -	23.41	- 0 -	26.56	28.21	37.97	28.21
Upper Level	46.01	72.19	80.02	46.01	79.09	66.57	85.13	59.93	48.87	44.65	48.87
Beginning Graduate	7.87	27.81	19.98	7.87	19.12	9.81	14.87	12.51	18.38	13.92	18.38
Advanced Graduate	- 0 -	- 0 -	- 0 -	- 0 -	1.79	.21	- 0 -	1.00	4.54	3.46	4.54
Totals											
Undergraduate	92.13	72.19	80.02	92.13	79.09	89.98	85.13	86.49	77.08	82.62	77.08
Graduate	7.87	27.81	19.98	7.87	20.91	10.02	14.87	13.51	22.92	17.38	22.92

TABLE 4
Percentage Distribution of the Formulas for
University Support and Administration from 11 States

Formula	Institution A	B	C	D	E	F	G	H	I	J	K
1	3.91	4.07	4.87	5.07	5.51	6.90	7.21	12.09	14.27	17.64	18.46
2	2.88	3.40	4.36	4.38	5.29	6.80	7.53	13.15	14.62	18.23	19.36
3	2.80	3.51	4.10	4.28	5.32	6.30	7.11	13.24	14.87	18.53	19.94
4	2.53	2.81	3.64	4.07	4.88	6.49	6.91	13.65	15.38	19.20	20.44
5	2.23	2.53	3.45	3.84	4.55	6.35	6.96	13.45	15.75	19.85	21.24
6	2.38	2.88	3.60	4.00	4.83	6.47	6.89	13.17	15.63	19.78	20.41
7	2.21	2.53	3.41	3.80	4.52	6.34	6.93	13.35	15.70	19.56	21.65
8	2.21	2.53	3.41	3.80	4.52	6.34	6.93	13.35	15.70	19.56	21.65
9	2.21	2.53	3.41	3.80	4.52	6.34	6.93	13.35	15.70	19.56	21.65
10	2.52	2.52	3.53	4.33	4.41	6.81	6.98	13.91	14.87	20.06	20.06
11	2.42	2.82	3.60	4.11	4.37	6.14	6.44	12.94	15.88	20.15	21.15

TABLE 5
Analysis of Percentage Distribution of the Formulas for Overall University Support from 11 States

		Institution									
		A	B	C	D	E	F	G	H	I	J	K
I.	Mean Workload Distribution	2.37	2.63	3.53	4.09	4.63	6.65	7.23	14.03	15.05	19.40	20.39
II.	Formula Distribution											
	Mean	2.57	2.92	3.75	4.13	4.79	6.48	6.98	13.24	15.30	19.27	20.55
	Standard Deviation	.51	.52	.48	.41	.41	.35	.26	.40	.55	.80	1.04
III.	Difference between Mean Workload and Mean Formula Distribution as a percent of Mean Workload	8.44	11.03	6.53	.98	3.46	- 2.56	- 3.46	- 5.63	1.66	- .67	.78

TABLE 6
Percentage Distribution for
University Support, Excluding Library

	Institution										
	A	B	C	D	E	F	G	H	I	J	K
Formula											
2	4.04	3.95	4.90	5.64	5.61	7.51	7.59	13.08	13.29	17.28	17.11
3	3.07	3.66	4.10	4.56	5.35	6.23	6.87	13.04	14.22	17.85	21.05
4	2.53	2.82	3.69	4.14	4.76	6.69	7.15	13.61	15.20	19.02	20.39
8	2.74	3.49	4.17	4.53	5.53	7.31	7.97	14.06	14.23	17.55	18.42
8	2.21	2.53	3.41	3.80	4.52	6.34	6.93	13.35	15.70	19.56	21.65
9	2.21	2.53	3.41	3.80	4.52	6.34	6.93	13.35	15.70	19.56	21.65
11	2.69	3.19	3.97	4.52	4.65	6.56	6.85	13.63	15.88	17.05	21.01
Mean	2.78	3.17	3.95	4.43	4.99	6.71	7.18	13.45	14.89	18.27	20.18
Mean Workload Distribution	2.37	2.63	3.53	4.09	4.63	6.65	7.23	14.03	15.05	19.40	20.39
Difference between Mean Workload and Mean Formula Distribution as a percent of Mean Workload	17.30	20.53	11.90	8.31	7.78	.90	-.69	-4.13	-1.06	-5.81	-1.03